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L4: Entry 3 of 4 File: USPT Dec 15, 1998

DOCUMENT-IDENTIFIER: US 5850452 A
TITLE: Method for numerically scrambling data and its application to a programmable circuit

Brief Summary Text (18):
In an improvement, a second bits permutation may be applied to all data contained in a rewritable memory circuit. The rewritable memory may pertained to the programme memory or not. By applying data of the rewritable memory to a permutation circuit placed between this memory and the data bus, a scrambling of data to be memorized and an unscrambling of data to be transmitted are obtained, according to this second bits permutation.

Detailed Description Text (4):
This executable code is memorized in a programme memory of a programmable circuit: mask programming for a read-only memory and/or downloading in a rewritable memory (RAM, EEPROM or else).

Detailed Description Text (7):
In the example shown in FIG. 2, the programmable circuit includes a read-only memory ROM and rewritable memories, in the example a random memory RAM and an electrically programmable/erasable memory EEPROM. In this example, the executable code is memorized in the ROM and RAM memories.

Detailed Description Text (16):
The method according to the invention thus allows a different scrambling to be applied to instructions data of the programme memory than the one applied to other data: different memorized and transmitted forms, and also to apply a different scrambling to each one of the rewritable memories: permutation or not, selection of the bits permutation different from a rewritable memory to another.

CLAIMS:

6. A numerical scrambling method for a programmable circuit, comprising the steps of:

(a.) accepting a first set of data from a data bus, applying a first scrambling operation to said first set of data to produce a first set of scrambled data, which is then stored in a first rewritable memory;

(b.) accepting a second set of data from said data bus, applying a second scrambling operation, which is different from said first scrambling operation, to said second set of data to produce a second set of scrambled data, which is then stored in a second rewritable memory, which is different from said first rewrittable memory; and

(c.) when a memory read request is accepted, reading one of said sets of scrambled data from a respective one of said rewritable memories, applying a respective inverse scrambling operation, corresponding to a respective one of said scrambling operations, to said respective set of scrambled data to reproduce said respective set of data, and placing said set of data on said data bus.

8. The programmable system of claim 6, wherein said first rewritable memory is a random access memory.

9. The programmable system of claim 6, wherein said second rewritable memory is an electrically erasable, programmable memory.

14. A numerical scrambling method for a programmable circuit, comprising the steps of:

(a.) generating a first set of data:

(b.) applying a first scrambling operation to said first set of data to obtain a second set of scrambled data;

(c.) transmitting said second set of scrambled data over a data bus to a rewritable memory,

(d.) applying a second scrambling operation to said second set of scrambled data to produce a third set of scrambled data and storing said second set of scrambled data n said rewritable memory;

(e.) reading said third set of scrambled data from said rewritable memory and applying an inverse scrambling operation, corresponding to said second scrambling operation, to said third set of scrambled data to reproduce said second set of scrambled data, which is transmitted over said data bus;

(f.) applying an inverse scrambling operation, corresponding to said first scrambling operation, to said second set of scrambled data, to reproduce said first set of data.

17. A memory comprising:

a memory;

a data bus on which are transmitted a first set of data, which is in a scrambled form;

a scrambling circuit having an first and second port, said first port connected to said data bus, said second port being operatively connected to said memory;

wherein said scrambling circuit performs a permutation of said first set of data to obtain a second set of data which is then stored in said memory and performs a reverse permutation on said second set of data in said memory to reproduce said first set of data which is then transmitted on said data bus.

18. A memory according to claim 17, wherein said memory is rewritable.

19. A method according to claim 17, wherein said scrambling circuit is a passive circuit.

20. A processing unit comprising:

a processor, connected through a data bus to a first and a second memory;

a first passive scrambling circuit having a first and a second port, and connected to receive a first data string from said data bus and to permute said first data string into a first scrambled data set to be stored in said first memory;

a second passive scrambling circuit having a first and a second port, and connected to receive a second data string from said data bus and to permute said second data string into a second scrambled data set to be stored in said second memory;

wherein said first memory is a different type of memory from said second memory;

wherein said first scrambling circuit performs a different permutation from said second scrambling circuit.

21. A processing unit according to claim 20, wherein said first and second scrambling circuits are passive logic circuits.

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L4: Entry 2 of 4 File: USPT Sep 19, 2000

DOCUMENT-IDENTIFIER: US 6121902 A
TITLE: Optical disc recording apparatus, optical disc, and optical disc reproducing apparatus

Detailed Description Text (40):
The output data of the disc identification code table 55 is supplied to a scrambling circuit 56. The scrambling circuit 56 is composed of the M sequence generating circuit 57 and an exclusive-OR circuit 58. An output signal of the exclusive-OR circuit 58 is a disc identification code signal SC1. The disc identification code signal SC1 is an encrypted signal of a disc identification code. The M sequence generating circuit 57 is composed of a plurality of flip-flips and an exclusive-OR circuit.

Detailed Description Text (69):
In addition, the present invention can be applied to an optical disc, an optical disc recording apparatus that records data thereto, and an optical disc reproducing apparatus that reproduces data therefrom. In other words, the present invention can be applied to for example rewritable discs (such as a magneto-optic disc (MO), a phase change type disc PD, and a CD-E (CD-Erasable)), once-writable discs (such as a CD-R), and read-only optical discs (such as a CD-ROM and a DVD) as well as compact discs. Moreover, the present invention can be applied to a recording apparatus and/or a reproducing apparatus that records and/or reproduces data to/from such a disc.

Detailed Description Text (74):
In addition, before a disc identification code is recorded, it is encoded by a scrambling circuit. Thus, without encoding information, the disc identification code cannot be decoded. Consequently, the disc producer can prevent a third person from forging the disc identification code.

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L4: Entry 1 of 4 File: USPT Jul 1, 2003

DOCUMENT-IDENTIFIER: US 6587975 B2
TITLE: Semiconductor test apparatus and method

Detailed Description Text (31):
FIG. 5 shows an internal circuit configuration of the error catch memory portion 90. The error catch memory portion 90 of FIG. 5 comprises an address scrambling circuit 110 for translating the logical test address pattern 9 from the address generator 10 into a test pattern corresponding to a physical address of the memory under test 8. This scrambling circuit 110 includes an address-to-be-scrambled selecting circuit 111 (111x for address X, 111y for address Y) for selecting an address signal 112 (112x for address X, 112y for address Y) to be translated into a physical address out of the logical test address pattern 9; a scramble memory circuit 113 (113x for address X, 113y for address Y) for translating the selected address signal 112 into a memory address and storing the translated data; and a scramble address selecting circuit 115 (115x for address X, 115y for address Y) for selecting either a physically converted address signal 114 (114x for address X, 114y for address Y) or the logical address signal 9 in bits of the address. The address scrambling circuit 110 may be provided in the address generator 10.

Detailed Description Text (32):
The address scrambling circuit 110 makes it possible to fetch an error address in testing a memory under test by a physical address pattern for verification of memory cell interference.

Detailed Description Text (62):
The output address signal 181 of the address selecting circuit 179 is synchronized with the synchronizing clock signal 2 in a pipeline circuit 182.alpha.. Then, a selecting circuit 184 selects either an output signal 183 of the pipeline circuit 182.alpha. or the address signal 116 from the address scrambling circuit 110 (cf. FIG. 5) as a test address signal. The selected test address signal is further synchronized with the synchronizing clock signal 2 in a pipeline circuit 182.beta. and outputted as the test address signal 93 of the memory under test 8.

Detailed Description Text (139):
Each data I/O is rewritable since the error information is fetched for each data I/O (bit).

Detailed Description Text (175):
Each data I/O (bit) is rewritable since the error signal is fetched for each data I/O.

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End of Result Set

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L5: Entry 2 of 2 File: USPT Dec 15, 1998

DOCUMENT-IDENTIFIER: US 5850382 A
TITLE: Optical disk having a rewritable area and a read-only area

Abstract Text (1):
An optical disk is provided which includes a rewritable first recording area and a read-only second recording area. The first recording area includes groove tracks and land tracks divided into first sectors. Each first sector has a header region with identification data and a data region for recording user data. The second recording area includes tracks formed with physical bit rows, the tracks being divided into second sectors. Each second sector includes a header region and a data region having read-only data recorded as the bit rows. The header regions in the first sectors include pits the width of groove tracks and wobbled from a center line of the groove track. The header regions in the second sectors include pits having a width smaller than the groove tracks and formed along the center line of a track.

Brief Summary Text (3):
The present invention relates to an optical disk. More specifically, the present invention relates to a data format on an optical disk having a rewritable area and a read-only area.

Brief Summary Text (5):
Optical disks are classified into a read-only type which only allows for reproduction of recorded data and a rewritable type which allows the user to record data thereon. A read-only optical disk has tracks formed in a spiral or concentric shape on a disk substrate. An array of pits are physically formed along the tracks in accordance with information to be recorded. A rewritable optical disk has grooves formed in a spiral or concentric shape on a disk substrate and a recording layer formed over the grooves. The grooves define tracks. When the user is to record data on the disk, the disk is irradiated with a laser beam along the tracks, and the intensity of the laser beam is modulated in accordance with the data to be recorded so as to form regions with different optical properties (recording marks) on the recording layer.

Brief Summary Text (7):
A read-only optical disk and a rewritable optical disk have different data formats and modulation codes from each other. In order to allow the user to record data every sector, the data format of the rewritable optical disk is required to have, for example, a region for setting the laser power at the head of a recording region of each sector and a region for absorbing a variation of the rotation of a spindle motor at the end of the recording region. In the case of the read-only optical disk where no data is rewritten by the user, information has been recorded on the optical disk at the production of the optical disk with high precision, and no extra region for data recording by the user is required.

Brief Summary Text (8):
FIG. 21 shows a conventional optical disk 301 having a rewritable area and a read-only area. The optical disk 301 has a recording layer formed on a disk substrate so that the user can record and reproduce data on and from the optical disk. Referring to FIG. 21, the optical disk 301 includes read-only areas 302 and 303 located on the outer and inner portions thereof, respectively, and a rewritable area 305 located between the read-only areas 302 and 303.

Brief Summary Text (9):
In the read-only areas 302 and 303, information and data have been previously recorded by forming physical pit arrays 304. In the rewritable area 305, groove-shaped guide

tracks 306 have been previously formed so that the user can record and reproduce information and data by tracking the grooves of the tracks (groove tracks) or lands between adjacent grooves (land tracks).

Brief Summary Text (10):
FIG. 22 is a block diagram showing a conventional optical disk recording/reproducing apparatus 300 for recording/reproducing data on/from the optical disk 301 shown in FIG. 21. Referring to FIG. 22, the optical disk recording/reproducing apparatus 300 includes an optical head 307 for recording/reproducing data, a first signal processing section 320 for processing a reproduction signal supplied from the rewritable area 305 of the optical disk 301, a second signal processing section 330 for processing a reproduction signal supplied from the read-only areas 302 and 303 of the optical disk 301, and a switch 308 for connecting the reproduction signal from the optical head 307 to either the first signal processing section 320 or the second signal processing section 330. The first signal processing section 320 includes a first digitizing circuit 309, a first PLL (phase-locked loop) 310, a first timing generator 311, and a first demodulator 312. Likewise, the second signal processing section 330 includes a second digitizing circuit 313, a second PLL 314, a second timing generator 315, and a second demodulator 316.

Brief Summary Text (11):
When data recorded on the rewritable area 305 is to be reproduced, the switch 308 is switched to a terminal A to be connected with the first signal processing section 320. The reproduction signal supplied to the first signal processing section 320 is first converted into a digital signal by the first digitizing circuit 309, and clocked by the first PLL 310. The first timing generator 311 generates a gate signal for reading user data, and the user data is demodulated into binary data by the first demodulator 312. The demodulated data is output from a first output terminal 317.

Brief Summary Text (12):
In a conventional optical disk 301, different data formats and modulation codes are used in the rewritable area 305 and the read-only areas 302 and 303 as described above. Accordingly, the second signal processing section 330 for the read-only areas is separately required. When data recorded on the read-only areas 302 and 303 is to be reproduced, therefore, the switch 308 is switched to a terminal B to be connected with the second signal processing section 330. As in the first signal processing section 320 described above, the reproduction signal supplied to the second signal processing section 330 is first converted into a digital signal by the second digitizing circuit 313, and clocked by the second PLL 314. The second timing generator 315 generates a gate signal for reading user data, and the user data is demodulated into binary data by the second demodulator 316. The demodulated data is output from a second output terminal 318.

Brief Summary Text (13):
FIG. 23 schematically illustrates a data format of a sector 400 on the conventional rewritable optical disk 301.

Brief Summary Text (15):
Using the data format with the above configuration, the reproduction is conducted in the following manner. First, the clocking at the PLL circuit is stabilized by the repetition pattern stored in the VFO region 403. After the clock has been sufficiently stabilized, the data synchronous series 404a is detected and recognized to be the head of the information data region 450. Upon recognition, the first data block 405a is reproduced. Subsequently, the next data synchronous series 404b is detected to reproduce the next data block 405b. By repeating this operation, the data on the information data region 450 can be stably reproduced.

Brief Summary Text (17):
In the conventional optical disk, however, the data formats and modulation codes used in the rewritable area and the read-only area are different from each other as described above. The conventional recording/reproducing apparatus for such an optical disk needs to have two separate signal processing circuits for the rewritable area and the read-only areas, which complicates and enlarges the circuit size of the apparatus.

Brief Summary Text (19):
The optical disk of this invention has a rewritable first recording area and a read-only second recording area, wherein the first recording area includes first tracks composed of groove tracks consisting of grooves and land tracks consisting of spaces between adjacent grooves, the groove tracks and the land tracks being formed on an

optical disk substrate alternately in a spiral or concentric shape, each of the first tracks being divided into a plurality of first sectors, each of the first sectors including a first header region having identification data for identifying the first sector and a first data region for recording user data by forming recording marks by changing optical characteristics of a recording layer. The second recording area includes second tracks formed with physical bit rows arranged on the optical disk substrate in a spiral or concentric shape, each of the second tracks being divided into a plurality of second sectors, each of the second sectors including a second header region having identification data for identifying the second sector and a second data region having read-only data recorded as the bit rows. The first header region includes a physical first pit row, each pit of the first pit row having a width in a radial direction of the optical disk substantially equal to a width of the groove track and being wobbled outward or inward from a center line of the groove track by about a quarter of a pitch of the groove track, and the second header region includes a physical second pit row, each pit of the second pit row having a width in the radial direction of the optical disk smaller than the width of the groove track and being formed substantially along the center line of the second track.

Brief Summary Text (21):
In another embodiment of the invention, the identification data of the first header region and the identification data of the second header region have data formats with a same data sequence and a same data capacity, and the first data region and the second data region have data formats with a same data sequence and a same data capacity.

Brief Summary Text (23):
In still another embodiment of the invention, in the rewritable first recording area, each of the first sectors includes a mirror mark region, a gap region, and a first dummy data region which are formed between the first header region and the first data region and a guard data region and a buffer region which are formed between the first data region and a first header region of a next first sector, and in the second recording area, each of the second sectors including a second dummy data region formed between the second header region and the second data region and a third dummy data region formed between the second data region and a second header region of a next second sector.

Brief Summary Text (25):
Alternatively, the optical disk of this invention has a rewritable first recording area and a read-only second recording area, wherein the first recording area includes first tracks composed of groove tracks consisting of grooves and land tracks consisting of spaces between adjacent grooves, the groove tracks and the land tracks being formed on an optical disk substrate alternately in a spiral or concentric shape. Each of the first tracks is divided into a plurality of first sectors. Each of the first sectors including a first header region having identification data for identifying the first sector and a first data region for recording user data as recording marks by changing optical characteristics of a recording layer. The second recording area includes second tracks formed with physical bit rows arranged on the optical disk substrate in a spiral or concentric shape. Each of the second tracks being divided into a plurality of second sectors, each of the second sectors including a second header region having identification data for identifying the second sector and a second data region having read-only data recorded as the bit rows. Data series of the first and second recording areas are modulated with a same modulation code, the first and second sectors have a same data capacity, the first and second header regions have a same data sequence, and the first and second data regions have a same data sequence and a same data capacity.

Brief Summary Text (34):
Alternatively, the optical disk of this invention has a rewritable first recording area and a read-only second recording area, wherein the first recording area includes first tracks composed of groove tracks consisting of grooves and land tracks consisting of spaces between adjacent grooves, the groove tracks and the land tracks being formed on an optical disk substrate alternately in a spiral or concentric shape. Each of the first tracks is divided into a plurality of first sectors. Each of the first sectors including a first header region having identification data for identifying the first sector and a first data region for recording user data by forming recording marks obtained by changing optical characteristics of a recording layer. The second recording area includes second tracks formed with physical bit rows arranged on the optical disk substrate in a spiral or concentric shape. Each of the second tracks is divided into a plurality of second sectors, each of the second sectors including a second header region having identification data for identifying the second sector and a second data region having read-only data recorded as the bit rows. At least one of the first and

second data regions includes: a first data synchronous series provided at a head of the data region for specifying a start timing position of the data region; a second data synchronous series preceding the first data synchronous series for specifying a start timing position of the data region; and a third data synchronous series preceding the second data synchronous series and having a specific repetition sequence pattern of a modulation code in the data region.

Brief Summary Text (41):
Thus, the invention described herein makes possible the advantage of providing an optical disk having a rewritable area and a read-only area which can reduce the circuit size of a recording/reproducing apparatus using the optical disk and provide stable reproduction.

Drawing Description Text (2):
FIG. 1 illustrates an optical disk having a rewritable area and read-only areas according to the present invention.

Drawing Description Text (3):
FIGS. 2A to 2H illustrate data formats and reproduction signals used in the optical disk according to the present invention.

Drawing Description Text (5):
FIGS. 4A to 4H illustrate data formats and reproduction signals used in another optical disk according to the present invention.

Drawing Description Text (9):
FIGS. 8A to 8D illustrate data formats of dummy data regions according to the present invention.

Drawing Description Text (11):
FIGS. 10A and 10B illustrate a data format in the rewritable area according to the present invention.

Drawing Description Text (12):
FIGS. 11A and 11B illustrate a data format in the read-only areas according to the present invention.

Drawing Description Text (15):
FIGS. 14A and 14B illustrate data formats in the rewritable area and the read-only areas of an optical disk according to the present invention.

Drawing Description Text (25):
FIG. 23 illustrates a data format of the conventional optical disk.

Detailed Description Text (5):
Referring to FIG. 1, an optical disk 1 of Example 1 includes read-only areas 2 and 3 located on the outer and inner portions thereof, respectively, and a rewritable area 5 located between the read-only areas 2 and 3.

Detailed Description Text (6):
In the read-only areas 2 and 3, pit rows are physically formed as tracks. The length and position of each pit in the pit rows have been determined in accordance with read-only data recorded on the read-only areas 2 and 3. In the rewritable area 5, guide grooves (guide tracks) 6 are formed in a spiral or concentric shape on the disk substrate. Information and data are recorded along the grooves (groove tracks) or lands between adjacent grooves (land tracks). Hereinbelow, the groove tracks and the land tracks are collectively referred to as information tracks. In FIG. 1, the optical disk 1 is shown to have spiral tracks on either area.

Detailed Description Text (7):
Each of the information tracks in the rewritable area 5 is divided into a plurality of sectors. Each sector includes a first header region having identification data for identifying the sector and a first data region for storing user data by forming recording marks by changing the optical properties of the recording layer. Likewise, each track in the read-only areas 2 and 3 is divided into a plurality of sectors. Each sector of the read-only areas 2 and 3 includes a second header region having identification data for identifying the sector and a second data region having read-only data recorded thereon in the form of the pit rows. In this way, by dividing each track corresponding to one rotation of the optical disk into a plurality of

sectors (data units), management of the positions of necessary data on the optical disk and high-speed data retrieval can be realized.

Detailed Description Text (8):
FIGS. 2A to 2H shows data formats of the optical disk 1 of this example. A data format in the rewritable area 5 will be first described. FIG. 2A shows an exemplified data format of each sector 10 in the rewritable area 5, and FIG. 2C shows a physical configuration of the information track corresponding to the sector 10 of FIG. 2A. FIG. 2A shows data formats of two adjacent information tracks, i.e., a groove track 7 corresponding to the guide track 6 and a land track 8 adjacent to the groove track 7, for comparison with the physical configurations thereof shown in FIG. 2C. Such a groove track 7 and land track B alternately appear in the rewritable area 5 of the optical disk 1. The user can record desired information (user data) on both the groove track 7 and the land track 8 by tracking the groove track 7 and the land track 8 separately.

Detailed Description Text (19):
Thus, in the rewritable area 5, data is recorded on the groove track 7 and the land track 8 in accordance with the data formats described above.

Detailed Description Text (20):
Then, a data format in the read-only areas 2 and 3 will be described with reference to FIGS. 2B and 2D. FIG. 2B shows an exemplified data format of each sector 30 of the read-only areas 2 and 3, and FIG. 2D schematically illustrates a physical configuration of the track corresponding to the sector 30 of FIG. 2B.

Detailed Description Text (21):
In the read-only areas 2 and 3, a track 9 is composed of a pre-recorded pit row 29 (a pre-pit row). As shown in FIG. 2D, the pit rows are formed in accordance with the same physical format over the entire data region in the read-only areas 2 and 3. More specifically, the width of the pit row 29 in the radial direction of the optical disk 1 is smaller than the width (groove width) of the guide groove 6 (groove track 7) formed in the rewritable area 5, and all the pits are lined substantially along the center line of the track.

Detailed Description Text (22):
Like the rewritable area 5, each track in the read-only areas 2 and 3 is divided into a plurality of sectors 30 for data recording so as to manage the positions of necessary information data on the optical disk and realize high-speed data retrieval. It will be preferable for practical information recording/reproduction if the sectors in the read-only areas 2 and 3 and the rewritable area 5 can be managed in a same manner and the processing such as sector retrieval are unified. To realize this unified processing, in this example, the length of each sector and the lengths of the header region and the data region of each sector in the read-only area 2 and 3 are made equal to those in the rewritable area 5 to match the data format in the read-only area with that in the rewritable area.

Detailed Description Text (23):
A specific data format in the read-only areas 2 and 3 will be described as an example. Referring to FIG. 2B, the sector 30 includes a second header region 31 (sector identification data PID1 and PID2) and a second data region 37. A second dummy data region 35 (VFO1) is formed between the second header region 31 and the second data region 37. A third dummy data region 38 (VFO2) is formed between the second data region 37 and a second header region 13' of a next sector 30'.

Detailed Description Text (24):
Referring to FIG. 2D, the pit row 29 of the second header region 31 is lined substantially along the center line of the track 9, not displaced outward or inward as in the first header region 11 in the rewritable area 5. The width of the pit row 29 in the read-only areas 2 or 3 in the radial direction of the optical disk 1 is smaller than the groove width unlike the width of the pit row 21 in the rewritable area 5 which is substantially equal to the groove width.

Detailed Description Text (26):
As is observed from FIGS. 2A and 2B, the first header region 11 in the rewritable area 5 and the second header region 21 in the read-only areas 2 and 3 are the same in the data capacity, the data format (signal sequence), and the modulation codes. Also, the first data region 17 in the rewritable area 5 and the second data region 37 in the read-only areas 2 and 3 are the same in the data capacity, the data format (signal sequence), and the modulation codes.

Detailed Description Text (27):
Further, as shown in FIGS. 2A and 2B, a head (start timing) 16 of the first data region 17 in the rewritable area 5 and a head (start timing) 36 in the second data region 37 in the read-only areas 2 and 3 are matched with each other.

Detailed Description Text (28):
Thus, by using the same formats (signal sequences) for the first and second header regions 11 and 31 and for the first and second data regions 17 and 37 in the rewritable area 5 and the read-only areas 2 and 3, one reproduction signal processing circuit can be shared by both the rewritable area 5 and the read-only areas 2 and 3, and thus the circuit size can be reduced.

Detailed Description Text (29):
The second dummy data region 35 is formed to prevent the servo tracking from becoming unstable due to discontinuation of tracking error signals which may occur if no pit row is formed between the second header region 31 and the second data region 37. The second dummy data region 35 includes, for example, a specific data pattern of the same modulation code as that used for the first dummy data region (VFO region) 15 in the rewritable area 5. With this arrangement, it is possible to promptly and stably clock the PLL of the reproduction signal processing circuit. Random data or any other data may also be used to stabilize the servo tracking.

Detailed Description Text (32):
Thus according to the data format of the optical disk 1 of Example 1, the first header region 11 is commonly used for the tracking of both of the groove track 7 and the land track 8. Thus, separate exclusive header regions for the groove track 7 and the land track 8 are not required.

Detailed Description Text (33):
Since the first header region 11 can be easily and precisely formed on the optical disk by wobbling a light beam for cutting the guide groove 6 (groove track 7) rightward and leftward from the track center, a separate exclusive light source for forming the first header region is not required. Thus, the preformat in the rewritable area 5 of the optical disk 1 of this example can be easily formed by use of a single light source for cutting, reducing the circuit size of the recording/reproducing apparatus for this optical disk.

Detailed Description Text (35):
The 2-part optical detector 110 (parts 110a and 110b) which is disposed in an optical head (not shown) receives reflected light from the groove track 7 and the land track 8 (the recording mark arrays 22 and the pit rows 21) in the rewritable area 5 of the optical disk 1 and reflected light from the track 9 (the pit row 29) in the read-only areas 2 and 3, and converts the reflected light into a reproduction signal.

Detailed Description Text (38):
In the case of using the data formats shown in FIGS. 2A to 2D, the difference signal S2 is obtained only when the reproduction signal is obtained from the first header region 11 in the rewritable area 5, as will be described later in detail. Accordingly, as shown in FIG. 2E, the control signal S3 output from the envelope detector 120 becomes high only when the first header region 11 in the rewritable area 5 is detected. The output signal S4 from the switch circuit 113 is therefore equal to the difference signal S2 only when the first header region 11 is detected. Otherwise, the output signal S4 is equal to the sum signal S1. That is, the sum signal S1 is output from the switch circuit 113 as the output signal S4 when the reproduction signal is obtained from the information region 20 in the rewritable area 5 and the entire read-only areas 2 and 3.

Detailed Description Text (41):
Hereinbelow, the waveforms of the signals obtained when recorded data on the information track in the rewritable area 5 (i.e., user data already recorded on the information region 20) is reproduced until it is converted into a binary signal will be described. FIG. 2G is an output waveform of the sum signal S1 obtained from the rewritable area 5, and FIG. 2F is an output waveform of the difference signal S2.

Detailed Description Text (42):
As shown in FIG. 2G, the portion of the sum signal S1 corresponding to the first header region 11 in the rewritable area 5 is not detected by the digitizing circuit 114 because an amplitude 41 thereof is smaller than a predetermined threshold 40 for

digitizing. The reason why the amplitude 41 is small is that the pit row of the first header region 11 is slightly displaced outward (the former half 11a) or inward (the latter half 11b) from the center line of the groove track. This causes a light beam from the optical head to be diffracted by the pit rows 21a and 21b and thus reduces the light amount received by the optical detector 110.

Detailed Description Text (43):
On the contrary, an amplitude 42 of the sum signal S1 corresponding to the information region 20 in the rewritable area 5 exceeds the threshold 40 for digitizing because the recording mark array 22 is formed along the center line of the information track. The sum signal S1 is therefore detected by the digitizing circuit 114, and the reproduction signal is obtained.

Detailed Description Text (44):
FIG. 2F shows an output of the difference signal S2 obtained from the rewritable area 5. Since the pit row 21a in the former half 11a of the first header region 11 is displaced outward, a larger amount of reflected light from the pit row 21a is diffracted to the outward part 110a of the 2-part optical detector 110. Accordingly, the difference signal S2 output from the 2-part optical detector 110 has an amplitude 51a which exceeds a positive threshold 50a for digitizing as shown in FIG. 2F. The difference signal S2 is therefore detected by the digitizing circuit 114, and the reproduction signal is obtained.

Detailed Description Text (46):
On the contrary, in the information region 20 in the rewritable area 5, since the recording mark array 22 is formed along the center line of the information track, the light amounts received by the outward and inward parts 110a and 110b of the 2-part optical detector 110 are substantially the same. Therefore, an amplitude 52 of the difference signal S2 is too small to reach the threshold 51a (51b) for digitizing as shown in FIG. 2F. Likewise, in the read-only areas 2 and 3, since the pit row 29 is formed along the center line of the track 9, the light amounts received by the outward and inward parts 110a and 110b of the 2-part optical detector 110 are substantially the same. The difference signal S2 is substantially not output. Therefore, in the regions other than the first header region 11, the difference signal S2 is not detected by the binary detector 114, and thus no reproduction signal is obtained.

Detailed Description Text (48):
Thus, in the optical disk recording/reproducing apparatus 100 for reproducing information from the optical disk 1 with the above-described data formats, unlike the conventional apparatus, separate reproduction signal processing circuits for the rewritable area and the reproduction-only area are not required, but a common signal processing section can be used. This reduces the circuit size of the optical disk recording/reproducing apparatus, and realizes a reproduction signal processing circuit with a simpler configuration and higher reliability.

Detailed Description Text (50):
FIGS. 4A to 4H show data formats of an optical disk of Example 2 according to the present invention. The basic configuration of the optical disk of this example is the same as that of the optical disk 1 of Example 1. The same components as those of the optical disk 1 are denoted by the same reference numerals, and the description thereof is omitted here. In this example, as in Example 1, one track corresponding to one rotation of the-optical disk is divided into a plurality of sectors. Each sector starts with a header region including sector identification data representing address information of the sector. In this example, the data format in the read-only area will mainly be described.

Detailed Description Text (51):
FIG. 4A is an exemplified data format of each sector 10 in the rewritable area 5, and FIG. 4C shows a physical configuration of the information track corresponding to the sector 10 of FIG. 4A. As shown in FIG. 4C, the groove guide track 6 constitutes the groove track 7 and a land between adjacent grooves constitutes the land track 8. Such groove tracks 7 and land tracks 8 alternately appear in the rewritable area 5 of the optical disk 1. The user can record desired information (user data) on both the groove track 7 and the land track 8 by tracking the groove track 7 and the land track 8 separately.

Detailed Description Text (52):
In this example, as shown in FIG. 4A, the groove track 7 and the land track 8 are described collectively as an information track 6'. The sector 10 in the rewritable area

5 includes the first header region 11 at the head thereof. The first header region 11 is divided into the former half 11a (sector identification data PID1) and the latter half 11b (sector identification data PID2). As shown in FIG. 4C, the physical pit rows 21a and 21b are formed in correspondence with the former half 11a and the latter half 11b, respectively.

Detailed Description Text (60):
Thus, in the rewritable area 5, the groove track 7 and the land track 8 are formed in accordance with the above-described data format to record data in the area.

Detailed Description Text (61):
Referring to FIGS. 4B and 4D, a data format in the read-only areas 2 and 3 will be described. In this example, as in Example 1, the data format in the read-only areas is matched with the data format in the rewritable area. FIG. 4B shows an exemplified data format of each sector 30 in the read-only areas 2 and 3, and FIG. 4D schematically shows a physical configuration of the track composed of the pit row 29 corresponding to the sector 30 of FIG. 4B.

Detailed Description Text (62):
In the read-only areas 2 and 3, the track 9 is composed of the pre-recorded pit row 29 (a pre-pit row). As shown in FIG. 4D, all the pit rows in the read-only areas 2 and 3 are formed in accordance with a uniform physical format. More specifically, the width (pit width) of the pit row 29 in the radial direction of the optical disk 1 is smaller than the width (groove width) of the guide groove 6 (groove track 7) formed in the rewritable area 5, and all the pits are lined substantially along the center line of the track for servo tracking.

Detailed Description Text (65):
The information amount recorded on the second data region 37 of one sector 30 is made equal to that of the first data region 17 of one sector 10 in the rewritable area 5, and the same format as that in the rewritable area 5 is used for an additional error correction code and the like. With this arrangement the length of the second data region 37 is substantially the same as that of the first data region 17.

Detailed Description Text (66):
In general, data recording in the read-only area is performed by embossing with high precision at the fabrication of the disk. In the read-only area, data is only reproduced and no arrangement to respond to rewriting by the user is required. Therefore, regions such as the gap region 13, the first guard data region 23, the second guard data region 18, and the buffer region 19 formed in the rewritable area are not required. These regions should be deleted if the recording capacity of the optical disk is considered with priority. However, if these regions are deleted, the data format in the read-only area becomes different from that in the rewritable area. This requires to provide two separate exclusive signal processing sections each including a timing generator and a demodulator for the read-only area or the rewritable area, and switch the two processing sections appropriately, as in the conventional apparatus described above. If regions corresponding to the gap region 13, the first guard data region 23, the second guard data region 18, and the buffer region 19 in the rewritable area 5 are formed in the read-only area so as to synchronize the reproduction timing and no pit row is formed in these regions, the tracking error signal is discontinued at these regions, making the servo tracking in the read-only area unstable.

Detailed Description Text (68):
A specific pattern of the modulation code used for modulation of data (a pattern of a specific bit length corresponding to a specific pulse width and pulse interval) as in the first dummy data region 15 (VFO) in the rewritable area 5, for example, can be sequentially recorded on the second and third dummy data regions 33 and 34. Using such a specific pattern, prompt and stable clocking of the PLL of the reproduction signal processing circuit can be realized.

Detailed Description Text (69):
A mirror region may be formed between the second header region 31 and the second dummy data region 33 as in the rewritable area.

Detailed Description Text (70):
When data recorded on the optical disk of this example is to be reproduced, the same procedure as that described in Example 1 with the optical disk recording/reproducing apparatus 100 shown in FIG. 3 can be employed. In this case, the waveforms of the envelope detection signal, the difference signal obtained from the rewritable ares, the

sum signal obtained from the rewritable area, and the sum signal obtained from the read-only area are as shown in FIGS. 4E to 4H, respectively.

Detailed Description Text (71):
Thus, in this example, the sector lengths and main portions of the data formats of the rewritable area and the read-only areas are made substantially equal to each other. With this arrangement, the sectors in the read-only areas and the rewritable area can be managed in the same manner, and the processing such as sector retrieval can be unified. Thus, one reproduction signal processing circuit can be commonly used for the rewritable area and the read-only areas. This reduces the circuit size.

Detailed Description Text (72):
In this example, the first data region 17 in the rewritable area and the second data region 37 in the read-only area are arranged to start at the same timing as shown in FIGS. 4A and 4B. The unified sector management according to the present invention can also be realized in the case where these data regions are displaced with each other as long as they have the same length.

Detailed Description Text (74):
In Example 3, a data sequence which realizes stable servo tracking at the reproduction of data recorded in the read-only area will be described. In this example, the data formats in the rewritable area and the read-only areas described in Example 2 are used.

Detailed Description Text (87):
Hereinbelow, data formats of the second and third dummy data regions 33 and 34 which are effective to prevent the disturbance of servo tracking as described above will be described.

Detailed Description Text (88):
FIG. 8A shows an exemplified data format where the second and third dummy data regions 33 and 34 include M-series random data regions 73 and 74, respectively. By setting different initial values of the M-series random data for at least adjacent two tracks, the patterns of pit rows on the adjacent tracks have no correlation with each other, and thus the coincidence of pit edges between the adjacent tracks is made random. As a result, the servo tracking by the phase error detection method can be relatively stably controlled.

Detailed Description Text (89):
FIG. 8B shows an exemplified data format where the second dummy data region 33 includes the M-series random data region 73 as shown in FIG. 8A and a subsequent VFO region 75 (VFO1) composed of a specific pattern of the modulation code used for modulation of data as that used on the VFO region 15 in the rewritable area (see FIG. 4A).

Detailed Description Text (91):
FIGS. 8C and 8D show exemplified data formats where the second dummy data region 33 includes data synchronous series 76 and 77, respectively, which can specify the timing of the start of the data region 37. FIGS. 8C and 8D show sectors of an even track and an odd track, respectively.

Detailed Description Text (95):
Thus, the exemplified data formats shown in FIGS. 8C and 8D where different data synchronous series are provided in the second dummy data regions 33 of the adjacent tracks can stabilize the servo tracking and ensures the detection of the start of the data region 37.

Detailed Description Text (97):
Data sequence suitable for servo tracking can be also used for the third dummy data region 34 in a manner similar to that described above for the second dummy data region 33. In this example, the data reproduction (servo tracking) in the read-only area was described. The data reproduction in the rewritable area can be performed in the manner described in Example 1 with reference to the optical disk recording/reproducing apparatus 100 shown in FIG. 3.

Detailed Description Text (107):
In this example, data series in the rewritable area or the read-only areas for realizing effective sector management will be described.

Detailed Description Text (108):

As described with reference to FIGS. 4A and 4B, for example, data to be recorded on the optical disk is divided into parts for a predetermined data capacity corresponding to the data region 17 (the rewritable area) or 37 (the read-only area) of each sector. An error correction code is added to the data for each sector. Such an error correction code may be complete within each sector. Alternatively, error correction coding may be performed for a set of a plurality of sectors. Such a block of a plurality of sectors is referred to as an ECC block, which is a unit for error correction coding. When one ECC block is composed of k sectors (e.g., k=16), an error having a length of about one sector can be corrected. Using such an error correction code, the number of sectors in the rewritable area and that in the read-only area are multiples of the number of sectors in one ECC block, i.e., multiples of k.

Detailed Description Text (109):
In order to effectively manage sectors of an optical disk, the sectors in the rewritable area and the read-only area are preferably managed with track basis. However, the number of sectors included in one track is not necessarily a multiple of the number of sectors included in one ECC block. Accordingly, when data is recorded on a plurality of ECC blocks of sectors, the data is not necessarily completed appropriately at the end of one track, but often ends midway of one track. In the rewritable area, the tracking control is possible even if there are remained sectors with no data recorded thereon because the groove or land track has been formed as a guide track. In the read-only area, however, the pit row is discontinued by the sector with no data recorded thereon, and thus the tracking control becomes unstable.

Detailed Description Text (110):
In order to overcome the above problem, in this example, dummy data is recorded on sectors left unrecorded after completion of recording data to fill the entire track with data so as to realize sector management with track basis. An example of such dummy data is a specific repetition pattern of a modulation code (a specific pulse width and pulse interval) as in the VFO region 15 in the rewritable area. Using such a pattern as the dummy data, the PLL of the reproduction signal processing circuit can be stably operated for the sector where user data has not been recorded.

Detailed Description Text (111):
In this example, M-series random data and a data synchronous series as in the second dummy data region in Example 3, as well as scrambled data as in Example 4, can be used. FIG. 9 shows an optical disk 1' of this example. As shown in FIG. 9, dummy data is recorded on sectors 71 in the read-only area 3 at the junction with the rewritable area 5. Likewise, dummy data is recorded on sectors 72 in the read-only area 2 at the junction with the rewritable area 5.

Detailed Description Text (112):
Thus, in this example, when data is recorded by every predetermined recording unit such as the error correction block (ECC), a sector left with no data recorded thereon is filled with dummy data. With this arrangement, the rewritable area and the read-only areas always start at the head of a track. This ensures effective management of sectors on the optical disk.

Detailed Description Text (114):
In Example 6, specific examples of data formats of the sector 10 in the rewritable area and the sector 30 in the read-only areas will be described.

Detailed Description Text (115):
FIGS. 10A and 10B show a data format of the sector 10 in the rewritable area, while FIGS. 11A and 11B show a data format of the sector 30 in the read-only areas. First, generation of data to be recorded on the first data region 31 of the sector 10 and the second data region 37 of the sector 30 will be described.

Detailed Description Text (127):
The above-described data configuration is commonly employed in the rewritable area and the read-only areas. The thus-obtained 2418B data is recorded on the first data region 17 in the rewritable area as shown in FIG. 10A or on the second data region 37 in the read-only areas as shown in FIG. 11A.

Detailed Description Text (128):
Referring to FIG. 10A, in the rewritable area, a 1B postamble region 45 (PA) follows the first data region 17. The 8/16 converting code needs to have an end mark at the end of the recording code so that the data can be correctly demodulated at the reproduction. Therefore, the postamble region 45 has a pattern obtained by demodulating

a predetermined code in accordance with a conversion rule as the end mark.

Detailed Description Text (132):
The first guard data region 23 precedes the VFO region 15 and the second guard data region 18 follows the PA region 45. As described in Example 4, when recording and erasure are repeated in a rewritable optical disk, the degradation at the start and end of the recording portion of the optical disk due to an increasing heat load. The guard data regions are provided to prevent this degradation from influencing the regions from the VFO region to the PA region. Each guard region should therefore be long enough to prevent this degradation.

Detailed Description Text (137):
In this example, as in Example 2, the second dummy data region 33 is formed between the header region 90 and the second data region 37, while the third dummy data region 34 is formed between the second data region 37 and the head of the next sector. As in the sector 10 in the rewritable area, the second dummy data region 33 includes a 35B VFO region 84 and a p3B presync region 46 (PS) to secure the reliability at the reproduction of data from the data region 37. The second dummy data region 33 further includes a 30B first pad region 82 and a postamble region 83 as shown in FIG. 11A. The third dummy data region 34 includes the postamble region 47, the second pad region 85, and the postamble region 86.

Detailed Description Text (140):
In the rewritable area, the lengths of the first and second guard data regions 23 and 18 are varied. In the read-only areas, the lengths of the pad regions are made to correspond to the average lengths of the corresponding first and second guard data regions 23 and 18. Thus, the lengths of the first and second pad regions 82 and 85 are 30B and 80B, respectively. The 1B postamble regions 83 and 86 follow the first and second pad regions 82 and 85, respectively, to terminate the modulation code.

Detailed Description Text (141):
The header regions in the rewritable area and the read-only areas will be described. As described in Example 2 with reference to FIG. 4A, the header region 11 in the rewritable area is divided into the former half 11a (sector identification data PID1) and the latter half 11b (sector identification data PID2). The corresponding pit rows 21a and 21b are displaced toward the opposite directions from the center line of the groove track 7 (the guide groove 6) by about a quarter of the groove pitch. In this example, also, the header region 80 is formed in the same manner.

Detailed Description Text (142):
FIG. 10B shows a data format of the header region 80 of the sector 10 in the rewritable area. As shown in FIG. 10B, the header region 80 is composed of four sets of sector identification data (PID) denoted by PID1, PID2, PID3, and PID4. The PID1 and PID2 constituting the 64B former half is displaced outward, while the PID3 and PID4 constituting the 64B latter half is displaced inward, for example.

Detailed Description Text (148):
The header region 90 in the read-only areas will be described with reference to FIGS. 11A and 11B. As described in Example 2 with reference to FIGS. 4A and 4B, the data arrangement of the header region 31 in the read-only areas is matched with the data arrangement of the header region 11 in the rewritable area, but the pit row on the header region 31 is lined along the center line of the track 9. The header region 90 in this example is formed in the manner described in Example 2. That is, the data sequence and the length (bit length) of the header region 90 in the read-only areas are made equal to those of the header region 80 in the rewritable area (FIG. 10A). More specifically, as shown in FIGS. 11A and 11B, the header region 90 with a length of 128B is composed of four sector identification data PIDs (PID1 to PID4). The PID1, for example, includes a first VFO region 231 (VFO1), an AM region 232, a Pid region 233, an IED region 234, and a postamble region 235 in this order, and has a length of 46B. Likewise, the PID2 includes a second VFO region 236 (VFO2), an AM region 237, a Pid region 238, an IED region 239, and a postamble region 240 in this order, and has a length of 18B. The PID3 and the PID4 of the latter half have the similar configurations to the above.

Detailed Description Text (149):
Thus, in this example, different data series can be formed on the dummy data regions 33 or 34 on adjacent tracks in the read-only areas. This can be realized by scrambling predetermined fixed data (e.g., FF) in the same manner as that for data recorded on the second data region 37, using different initial values between adjacent sectors. The

resultant scrambled data is then modulated with the recording code used for the data on the second data region 37 and recorded on the pad region 82 or 85. In this way, the servo tracking by the phase error detection method can be relatively stably controlled in the read-only areas. A scrambling circuit and a recording coding circuit used for generating data to be recorded on the second data region 37 can also be used for generating data to be recorded on the pad regions 82 and 85. This simplifies the configuration of a recording signal processing circuit, and the circuit size can be reduced.

Detailed Description Text (152):
In Example 6, exemplified data series on the sectors 10 and 30 in the rewritable area and the read-only areas were described. As shown in FIGS. 10A and 11A, the presync region 44 is formed following the VFO region 15 and preceding the first data region 17 in the rewritable area, while the presync region 46 is formed following the VFO region 84 and preceding the second data region 37 in the read-only areas.

Detailed Description Text (154):
In such a conventional data format, at the reproduction, after stable clocking of the PLL circuit by the VFO region 403, the data synchronous series 404a is detected. By the detection of the data synchronous series 404a, the head of the data region 450 is identified to reproduce the first data block 405a.

Detailed Description Text (157):
However, according to the data format in Example 6 described above, which has the presync region following the VFO region, the start timing of the first data block can be detected with high reliability even if an error arises in the first data synchronous series of the data region.

Detailed Description Text (159):
FIG. 14A shows a data format of one sector in the rewritable area of an optical disk of this example. FIG. 14B shows a data format of one sector in the read-only areas of the optical disk of this example. In FIGS. 14A and 14B, the same components as those in the previous examples are denoted by the same reference numerals.

Detailed Description Text (162):
Referring to FIG. 14B, in the read-only areas, the sector 30 includes the pad region 82 (DMY) and the postamble region 83 (PA), in place of the gap region 13 and the first guard data region 23 in the rewritable area, and the pad region 85 (DMY) and the postamble region 86 (PA), in place of the second guard data region 18 and the buffer region 19 in the rewritable area, so as to stabilize the tracking. The other portions of the sector 30 is the same as those of the sector 10 shown in FIG. 14A.

Detailed Description Text (163):
The second data synchronous series recorded on the presync region 44 of the sector 10 in the rewritable area and the presync region 46 of the sector 30 in the read-only areas will be described in detail. Herein-below, the presync region 44 of the sector 10 will be described as an example. It should be understood that the same is also applicable to the presync region 46 of the sector 30.

Detailed Description Text (164):
As described above, the data format of this example includes the second data synchronous series (the presync region 44 or 46) between the first data synchronous series 4a as the head of the data region and the third data synchronous series (the VFO region 15 or 84). A predetermined pattern which has high autocorrelation and does not appear in the other data portions is used for the second data synchronous series so that a specific position can be detected in the code sequence.

Detailed Description Text (195):
A specific example of the data format shown in FIG. 14A with a specific code pattern allocated for each region will be described. This specific example is also applicable to the data format shown in FIG. 14B. FIG. 17 shows an example of part of the data format from the VFO region 15 to the first data block 5a.

Detailed Description Text (207):
Regarding the preformat of the rewritable area, the first header region can be formed on the optical disk easily with high precision by wobbling a light beam for cutting and forming guide grooves (groove tracks) outward and inward from the center line of the groove tracks. This eliminates the necessity of providing an additional exclusive light source for forming the header region in the rewritable area.

Detailed Description Text (208):
Thus, according to the optical disk of the present invention, the preformat of the rewritable area can be easily formed with high precision using one light source for cutting. This makes it possible to form the preformat using a conventional cutting machine when both the rewritable area and the read-only area are formed on one optical disk.

Detailed Description Text (209):
According to the present invention, the sector length, the length of the header region, and the length of the data region in the read-only area are made equal to those in the rewritable area. As a result, the data format of the read-only area matches the data format of the rewritable area. This makes it possible to unify the sector managements of the read-only area and the rewritable area so as to unify the signal processing such as sector retrieval.

Detailed Description Text (210):
According to the present invention, there are provided the dummy data regions preceding and following the information data region in the read-only area. With this arrangement, the sector length, the length of the header region, and the length of data to be recorded on the sector in the read-only area can be made substantially equal to those in the rewritable area. This makes it possible to unify the sector managements of the read-only area and the rewritable area so as to unify the signal processing such as sector retrieval.

Detailed Description Text (211):
According to the optical disk of the present invention, separate reproduction signal processing circuits for the rewritable area and the read-only area are not necessary but one reproduction signal processing circuit can be shared when the rewritable area and the read-only area are formed on one optical disk. This makes it possible to reduce the circuit size of an optical disk recording/reproducing apparatus. Thus, a read-only signal processing circuit with a simpler circuit configuration and higher reliability can be realized.

Detailed Description Text (213):
According to the present invention, a sector in the read-only area left with no data recorded thereon is filled with dummy data. With this filling, the rewritable area can always start from the head of a track, and thus effective sector management is realized.

CLAIMS:

1. An optical disk having a rewritable first recording area and a read-only second recording area,

wherein the first recording area includes first tracks composed of groove tracks consisting of grooves and land tracks consisting of spaces between adjacent grooves, the groove tracks and the land tracks being formed on an optical disk substrate alternately in a spiral or concentric shape, each of the first tracks being divided into a plurality of first sector, each of the first sectors including a first header region having identification data for identifying the first sector and a first data region for recording user data by forming recording marks by changing optical characteristics of a recording layer,

the second recording area includes second tracks formed with physical bit rows arranged on the optical disk substrate in a spiral or concentric shape, each of the second tracks being divided into a plurality of second sectors, each of the second sectors including a second header region having identification data for identifying the second sector and a second data region having read-only data recorded as the bit rows,

the first header region includes a physical first pit row, each pit of the first pit row having a width in a radial direction of the optical disk substantially equal to a width of the groove track and being wobbled outward or inward from a center line of the groove track by about a quarter of a pitch of the groove track, and

the second header region included a physical second pit row, each pit of the second pit row having a width in the radial direction of the optical disk smaller than the width of the groove track and being formed substantially along the center line of a respective one of the second tracks.

3. An optical disk according to claim 1, wherein the identification data of the first header region has a header region data format with a header region data sequence and a header region data capacity, and the identification data of the second header region has a header region data format with the header region data sequence and the header region data capacity, and

the first data region has a first data region format having a data region data sequence and a data region data capacity, and the second data region has a data region data format with the data region data sequence and the data region data capacity.

7. An optical disk having a rewritable first recording area and a read-only second recording area,

wherein the first recording area includes first tracks composed of groove tracks consisting of grooves and land tracks consisting of spaces between adjacent grooves, the groove tracks and the land tracks being formed on an optical disk substrate alternately in a spiral or concentric shape, each of the first tracks being divided into a plurality of first sectors, each of the first sectors including a first header region having identification data for identifying the first sector and a first data region for recording user data as recording marks by changing optical characteristics of a recording layer,

the second recording area includes second tracks formed with physical bit rows arranged on the optical disk substrate in a spiral or concentric shape, each of the second tracks being divided into a plurality of second sectors, each of the second sectors including a second header region having identification data for identifying the second sector and a second data region having read-only data recorded as the bit rows,

a dàta series of the first recording area being modulated with a modulation code and a data series of the second recording area being modulated with the modulation code,

the first sector having a sector data capacity and the second sector having the sector data capacity,

the first header region having a header region data sequence and the second header region having the header region data sequence, and

the first data region having a data region data sequence and a data region data capacity, and the second data region having the data region data sequence and the data region data capacity.

16. An optical disk having a rewritable first recording area and a read-only second recording area,

wherein the first recording area includes first tracks composed of groove tracks consisting of grooves and land tracks consisting of spaces between adjacent grooves, the groove tracks and the land tracks being formed on an optical disk substrate alternately in a spiral or concentric shape, each of the first tracks being divided into a plurality of first sectors, each of the first sectors including a first header region having identification data for identifying the first sector and a first data region for recording user data by forming recording marks obtained by changing optical characteristics of a recording layer,

the second recording area includes second tracks formed with physical bit rows arranged on the optical disk substrate in a spiral or concentric shape, each of the second tracks being divided into a plurality of second sectors, each of the second sectors including a second header region having identification data for identifying the second sector and a second data region having read-only data recorded as the bit rows,

at least one of the first and second data regions comprises:

a first data synchronous series provided at a head of the at least one of the first and second data regions for specifying a start timing position of the at least one of the first and second data regions;

a second data synchronous series preceding the first data synchronous series for specifying a start timing position of the at least one of the first and second data regions; and

a third data synchronous series preceding the second data synchronous series and having a predefined repetition sequence pattern of a modulation code in the data region.